

An Easy Non-GIS Method for Making 3-D Digital Terrain Illustrations Using USGS 1:24,000- and 1:250,000-Scale Digital Elevation Models and Bryce4 Software

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ABSTRACT

Three-dimensional (3-D) digital terrain illustrations offer the graphic designer and scientist an excellent way to portray certain geologic, geomorphic, tectonic, and topographic features for a range of scientific and popular publications. Making such illustrations has, until recent years, required the use of sophisticated GIS software, a steep learning curve, and much time and patience. A non-GIS software, Bryce4, used in conjunction with Adobe Photoshop and Illustrator, provides graphic designers and scientists with an easy way to use USGS 1:24,000- and 1:250,000-scale Digital Elevation Models (DEMs) to make attractive 3-D terrain illustrations for use on the Web and in print and electronic publications. On this poster, we present the current status of non-GIS methods used in the Central Publications Group to produce 3-D terrain illustrations for use in USGS publications.

The poster presents a "cookbook" approach that includes all steps necessary to easily produce 3-D digital terrain illustrations. Toward that end, the poster reviews many of the steps discussed in Paterson (1998) and Sammis (1999). However, the poster presents additional information we think will be helpful to users, such as (1) how to maintain high resolution in 3-D terrain illustrations that will be used in print publications, (2) information on file formats and how to export 3-D images for further manipulation and corrections in Adobe Photoshop and Illustrator, (3) information about tools in Photoshop that are useful for manipulating colors and repairing imperfections in 3-D images exported from Bryce4, and (4) how to merge DEMs in Bryce4. Screen-optimized and print-optimized PDFs of the poster can be viewed and downloaded at URL <<http://epg.cr.usgs.gov/>>. The authors thank Diane Wells and Gene Ellis for their helpful reviews.

REFERENCES

Paterson, Tom, 1998, 3D landscape presentation-experiments at the U.S. National Park Service: Paper presented at the German Society of Cartography-Working Group of High Mountain Cartography, Bielefeld, Austria, February 26-March 1, 1998; also available on the World Wide Web at URL <<http://www.nps.gov/carto/silverstein/mn.html>> (on the server of the North American Cartographic Information Society).

Sammis, Ian, 1999, How to make relief maps with Bryce: MacADDICT, v. 4, no. 12, p. 94-96.

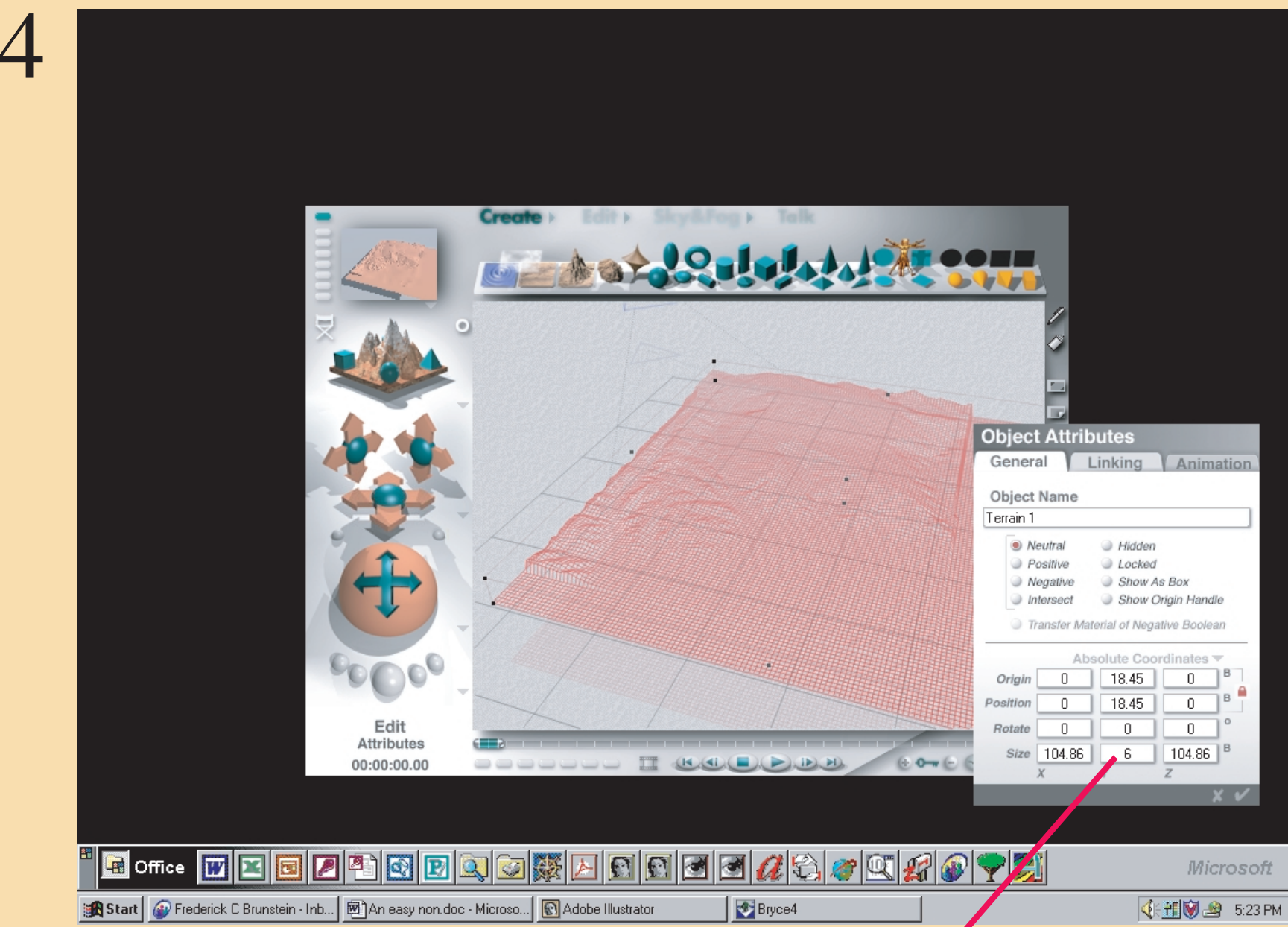
SOFTWARE FOR MAKING 3-D TERRAIN ILLUSTRATIONS

Bryce4: (a PC- and Mac-compatible computer program by MetaCreations), for more information see URL <<http://www.metacreations.com>>.

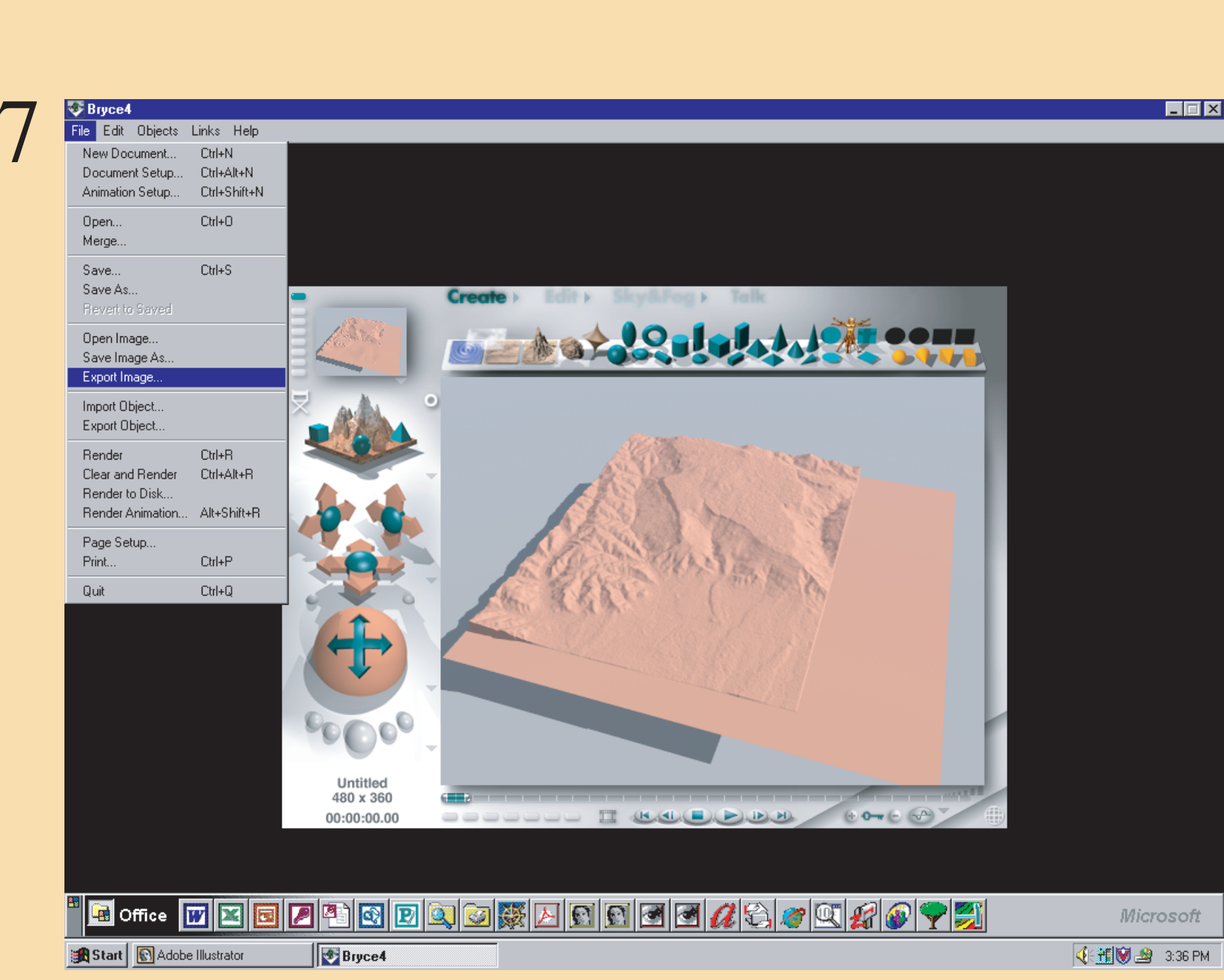
MICRODEM/TerraBase II 4.0: (a PC-compatible computer program written by Peter Guth of the Oceanography Department, U.S. Naval Academy); can be downloaded free of charge at URL <<http://www.usna.edu/Users/oceanoguth/website/microdem.htm>> [Note: at the present time, this software has the ability to make, manipulate, and display 3-D terrain images, but no capability is provided in the software to export such images for use in other programs.]

MacDen Beta 0.7: (a Mac-compatible computer program written by Jerry Farm <cmacdenweb@treevalley.com>); can be downloaded free of charge at URL <<http://www.nacs.org/epg28/resources.html>> [Note: at the present time, this software has the ability to make, manipulate, and display 3-D terrain images, but we are unsure of its capability to export such images for use in other programs.]

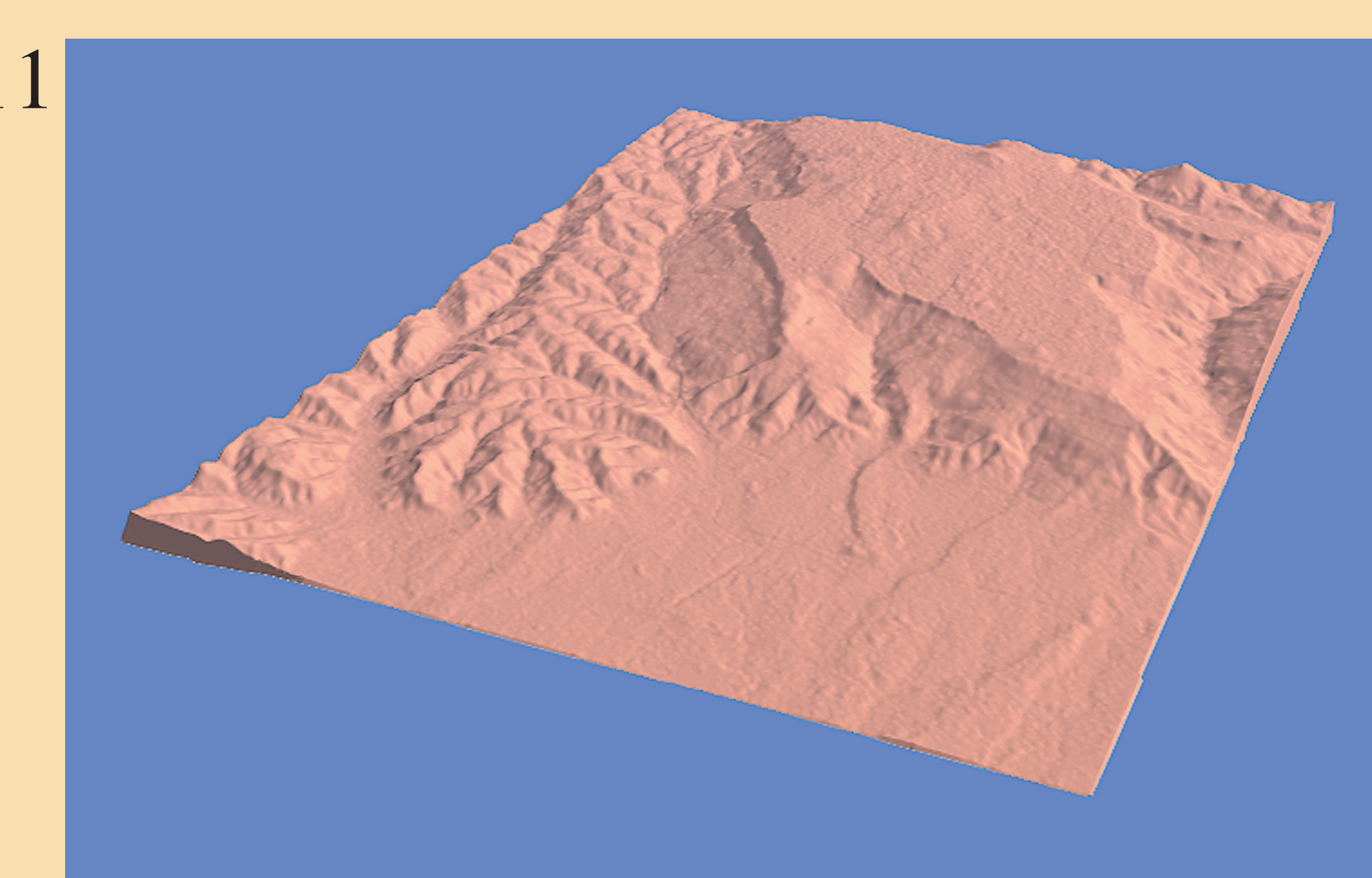
USGS WEB SITE FOR DOWNLOADING 1:24,000- AND 1:250,000-SCALE USGS DEM'S
[USGS DEM's are not available for other scales, such as 1:100,000, 1:500,000, and 1:1,000,000.]
<<http://edcwww.cr.usgs.gov/doc/elchome/ndcub/ndcub.html>>



Increase this number to increase the vertical exaggeration so that topographic features show up better.



Select File>Export Image. Save the image in the desired file format. We would usually export the image as an Adobe Photoshop file (.psd) for easy importing into Photoshop for image cleanup, color changes, enlarging or reducing, resolution changes, and other modifications. The image can also be exported and/or saved as Bitmap (.bmp), GIF (.gif), HTML (.htm), JPEG (.jpg), MacPict (.pct), and TIFF (.tif) file formats. If you are not yet ready to export the image to Photoshop, and still have further work to do in Bryce, the file can be saved as a Bryce4 file (.b4).



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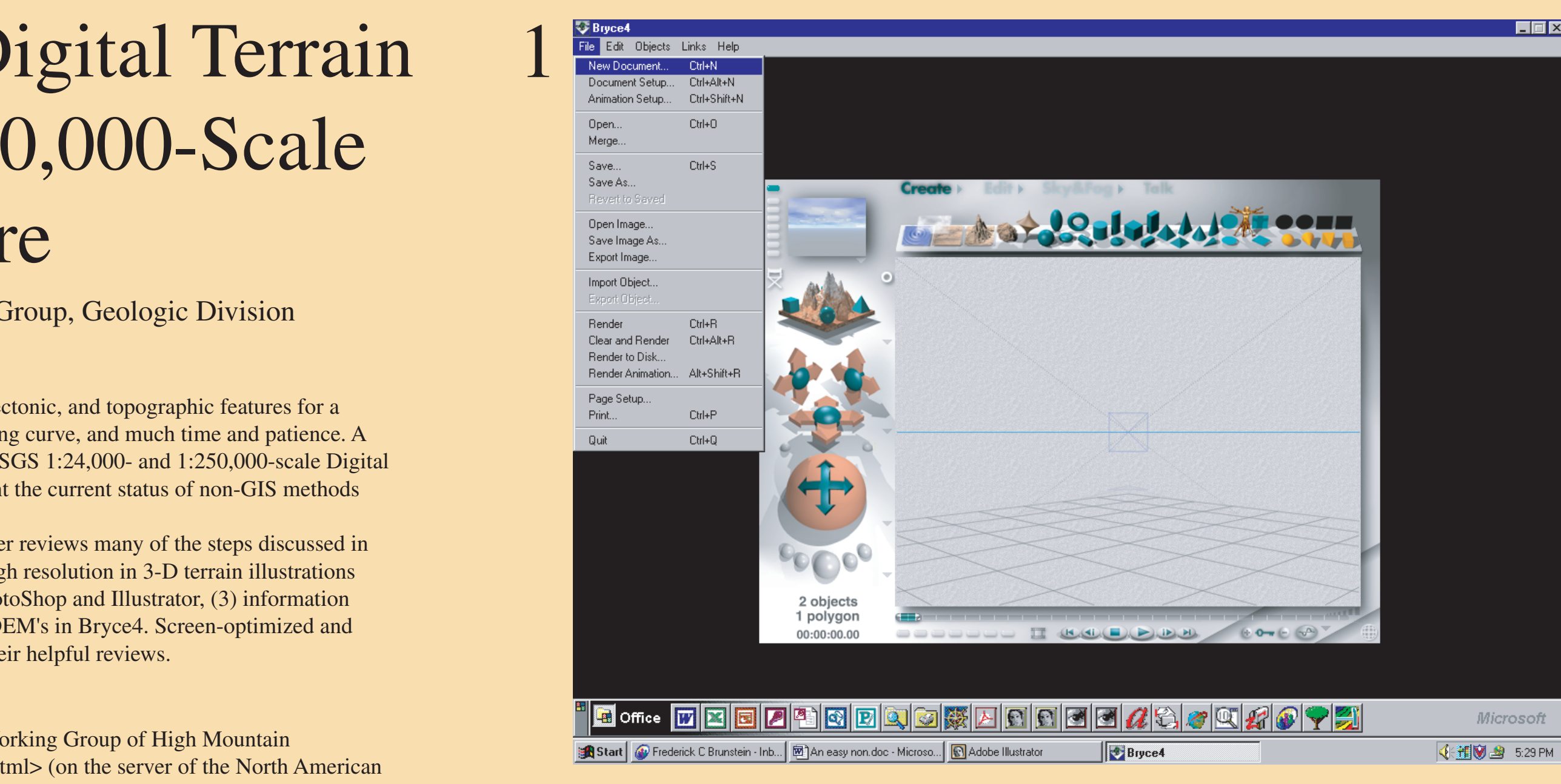
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Open Bryce4.
Select File>New Document.

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In the Document Setup window, select *Render Resolution* desired. Note that Bryce outputs 72 dpi files, which is fine for Web publications but is too low for print publications. However, resolution can be increased by increasing *Render Resolution* screen sizes, and then reducing and resampling the image at higher resolution in Photoshop (see step 8). Larger screen sizes provide larger images composed of more pixels and provide sufficient resolution for print publications when reduced and resampled at higher resolution in Photoshop (see step 8). The following table shows screen sizes converted to image sizes in inches and the sizes needed to convert to when resampling at 300 dpi in Photoshop in order to theoretically preserve maximum detail (see step 8). However, it is often easier to use larger resample sizes than recommended below, and still produce acceptable results when resampling at 300+ dpi.

Render resolution (pixels)	Size of image (inches)	Resample size at 300 dpi
120 x 90	1.6 x 1.25	0.4 x 0.3
240 x 180	3.3 x 2.5	0.8 x 0.6
480 x 360	6.6 x 5	1.6 x 1.2
720 x 540	10 x 7.5	2.3 x 1.8
960 x 720	13.3 x 10	3.2 x 2.3
1440 x 1080	20 x 15	4.8 x 3.6
1920 x 1440	26 x 20	6.2 x 4.8

Render resolution (pixels)

Size of image (inches)

Resample size at 300 dpi

Render resolution (pixels)

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Resample size at 300 dpi

Render resolution (pixels)

Size of image (inches)

Resample size at 300 dpi

Select *File>Import Object*. Find your DEM file in the directory structure and click Open. Bryce will open the DEM and display wireframe image of the DEM.

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